Wisconsin, containing the record of the work done during the year and quarter ending April 1887, has recently been published. Pending the appointment of a successor to Prof. Holden, who resigned his position as Director of the Observatory in the winter of 1885, to assume the direction of the Lick Observatory, Dr. Davies, Professor of Physics in the University of Wisconsin, has had general charge of the Observatory, to which of course he has been able to devote only a limited amount of time and attention. It is no doubt owing to this circumstance that no very definite programme of work has been carried out since the completion of the observations and reductions necessary for clearing off the list of 303 fundamental stars undertaken by Prof. Holden for the *Astronomische Gesellschaft*. The assistants, Mr. Updegraff and Miss Lamb, have been principally employed in observations of fundamental stars for determination of latitude and discussion of the instrumental errors of the meridian-circle and of refraction. The large equatorial has been used for measures of double stars, observations of Sappho and of Comet *b* 1887 (Brooks). A considerable portion of the volume is devoted to an index of the stars occurring in Airy's Greenwich Catalogues, not found in Flamsteed, which has been prepared by Miss Lamb. This index, which will be very useful to practical astronomers, has been prepared according to the general plan suggested by Argelander in his review of the Greenwich second seven-year Catalogue (*Vierteljahrsschrift*, Bd. vi. Heft 2), and contains some 3000 entries. The computer is thus saved the labour of looking through all six catalogues when searching for a star which is tolerably sure to be in one of them, and as the catalogues are reduced to six different epochs, the labour attending such a search would be considerable. The star places in Miss Lamb's index are reduced to 1875·0.

ASTRONOMICAL PHENOMENA FOR THE WEEK 1887 *OCTOBER* 16–22.

(FOR the reckoning of time the civil day, commencing at Greenwich mean midnight, counting the hours on to 24, is here employed.)

At Greenwich on October 16

Sun rises, 6h. 27m.; souths, 11h. 45m. 39·0s.; sets, 17h. 4m.; decl. on meridian, 8° 52′ S.: Sidereal Time at Sunset, 18h. 44m.

Moon (New on October 16, 23h.) rises, 5h. 22m.; souths, 11h. 27m.; sets, 17h. 21m.; decl. on meridian, 2° 20′ S.

Planet.	Rises. h. m.	Souths. h. m.	Sets. h. m.	Decl. on meridian. ° ′
Mercury ...	... 8 41	... 13 7	... 17 33	... 18 17 S.
Venus ...	... 3 37	... 9 40	... 15 43	... 0 9 S.
Mars ...	... 1 28	... 8 36	... 15 44	... 12 24 N.
Jupiter...	... 8 8	... 12 57	... 17 46	... 14 21 S.
Saturn...	... 23 6*	... 6 54	... 14 42	... 19 10 N.

* Indicates that the rising is that of the preceding evening.

Oct.	h.	
18 ...	1 ...	Jupiter in conjunction with and 4° 19′ south of the Moon.
18 ...	9 ...	Mercury in conjunction with and 7° 39′ south of the Moon.

Variable Stars.

Star.	R.A. h. m.	Decl. ° ′		h. m.	
U Cephei	0 52·3 ...	81 16 N. ...	Oct. 18,	4 11	*m*
Algol	3 0·8 ...	40 31 N. ...	,, 21,	5 43	*m*
ζ Geminorum ...	6 57·4 ...	20 44 N. ...	,, 20,	0 0	*m*
U Monocerotis ...	7 25·4 ...	9 33 S. ...	,, 16,		*m*
U Coronæ	15 13·6 ...	32 4 N. ...	,, 17,	4 15	*m*
R Scorpii	16 10·9 ...	22 40 S. ...	,, 20,		*M*
U Ophiuchi... ...	17 10·8 ...	1 20 N. ...	,, 17,	3 57	*m*
			and at intervals of	20 8	
X Sagittarii... ...	17 40·5 ...	27 47 S. ..	Oct. 20,	0 0	*m*
W Sagittarii ...	17 57·8 ...	29 35 S. ...	,, 17,	0 0	*m*
T Herculis	18 4·8 ...	31 0 N. ...	,, 19,		*m*
β Lyræ...	18 45·9 ...	33 14 N. ...	,, 21,	0 0	m_2
R Lyræ	18 51·9 ...	43 48 N. ...	,, 16,		*m*
η Aquilæ	19 46·7 ...	0 43 N. ...	,, 20,	1 0	*m*
R Sagittæ	20 8·9 ...	16 23 N. ...	,, 16,		*m*
S Delphini	20 37·9 ...	16 41 N. ...	,, 17,		*m*
T Aquarii	20 44·0 ...	5 34 S. ...	,, 17,		*m*
δ Cephei	22 25·0 ...	57 50 N. ...	,, 18,	1 0	*m*

M signifies maximum; *m* minimum; m_2 secondary minimum.

Meteor-Showers.

	R.A.	Decl.	
Near ξ′ Ceti	31° ...	8° N. ...	Slow; with trains.
,, ν Orionis... ...	90 ...	15 N. ...	Swift; streaks.
,, δ Geminorum ...	108 ...	23 N. ...	Swift; streaks.
,, κ Cephei	308 ...	78 N. ...	Slow; faint.

METEOROLOGICAL NOTES.

WE have just received the "Results of Meteorological and Magnetical Observations" made at Stonyhurst College during 1886, which maintains well the high character of previous issues. Pressure, at a height of 381 feet, fell, on December 8, to 27·350 inches, being absolutely the lowest hitherto noted at Stonyhurst. On the other hand, no excessively high readings occurred during the year, the maximum of each month being in each case topped by higher readings in previous years. For eight of the months temperature was under the normal, the deficiency being, in February, 5°·2; December, 4°·4; January, 3°·4; and March, 2°·3; and for the year, 1°·5. In October, temperature was 2°·9 above the average of the month. The annual rainfall was 5·18 inches above the mean, a result largely due to the heavy rains of January and May; but in February and August the fall was much less than usual. The actual sunshine for the year was 30 per cent. of the possible sunshine, the highest monthly percentage being 40 in April, and the lowest 20 in January. The maximum sunshine for the day occurs from 10 a.m. to 3 p.m., the absolutely highest hour being from 1 to 2 p.m. Among the more special meteorological work undertaken by the College are observations of cirrus clouds, upper glows, and trees, shrubs, and flowering plants. For the fourth year an appendix is given, exhibiting with some fullness the results of the observations made at St. Ignatius's College, Malta, by the Rev. J. Scholes.

THE Meteorological Commission of Cape Colony have published their Report for the year 1886, containing summaries of observations taken at 28 stations, and rainfall observations at 268 stations, including 3 in Basutoland and 11 in Orange Free State. At the Royal Observatory the absolute maximum temperature in a Glaisher stand was 104°·0 in January, and the minimum 34°·5 in August. In a Stevenson screen the maximum was 101°·0, and the minimum 35°·0 (in July), plainly showing the effect of radiation on the former readings. The total rainfall measured on 77 days was 27·79 inches, of which 7·68 inches fell in June. Self-recording anemometers are erected at the Royal Observatory, Port Elizabeth, and East London, but no arrangements are made for reducing the curves. The Commission draw special attention to the interesting series of thirteen rainfall maps appended to the Report. These have been reduced from maps exhibited by Mr. Gamble at the Indian and Colonial Exhibition, and represent the average rainfall of the colony for each month and for the whole year.

IN the *Annalen der Hydrographie und maritimen Meteorologie* for September, Capt. D. Ruete gives the results of eighteen years' experience of the typhoons of the China seas, accompanied by rules for manœuvring in different cases, and by charts of the tracks of the typhoons in various seasons. The distinguishing features of the typhoon are its small diameter and its sharply-defined central calm, as compared with ordinary rotatory storms. They occur most frequently in August and September, less frequently in July and October, and more rarely still in May, June, and November. They do not extend into the higher regions of the atmosphere; Knipping assumed a height of four nautical miles for the severe September typhoon of 1878. Their form is generally oval, but dependent on the contour of the coasts. The author finds that they travel slower when south of 30° N. than they do when north of that position, and that the faster they travel and the greater the area of the storm field, the more severe the typhoons are, and that the duration of the fall of the barometer gives no clue to the magnitude of the area of the storm, and further, that an approaching typhoon is shown less by the amount of the fall than by the general behaviour of the instrument. The regions most frequented by the typhoons extend from lat. 10° N. to 38° N. in the China seas, and to 50° N. in the Japan seas, and may be divided into four different seasons and districts, which are separately discussed in the paper.

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AT the meeting of the International Meteorological Committee at Paris in 1885, Dr. H. Wild, of St. Petersburg, and Prof. E. Mascart, of Paris, were requested to take the initiative in the publication of a series of international meteorological tables, to allow of a uniform method of reduction of the observations being everywhere carried out, and a specimen has now been printed and issued for criticisms. The work contains (1) a description of the tables and of their use, in English, French, and German; (2) equivalents of various units, and general tables used by different countries for meteorology, magnetism and electricity. The volume will occupy nearly 440 pages quarto, and will cost about 30*s*. The Committee request each country to contribute to the expense of publication by subscribing for a certain number of copies.

WE have received the results of meteorological observations made in New South Wales during 1885, under the direction of H. C. Russell, B.A., F.R.S., the Government Astronomer, forming a compact octavo volume of 360 pages, with plates of meteorological curves for each month. The great increase in the number of rainfall and river stations has made it necessary to publish these observations in a separate volume. Some important additions have been made to the information given in past years, and the barometric curves have been so arranged as to show the various changes through all the stations at one view. The tables show (1) the most important data for the whole colony; (2) the data for each station separately; (3) the barometric curves; and (4) the monthly abstracts published during the year. Considerable attention has been paid to the amount of evaporation in various parts of the colony, and the quantities for some districts are found to be much below what has often been stated, depending very much upon the state of the soil. The year 1885 was one of serious drought, although the total rainfall for the year was only 10 per cent. below the average, owing to heavy rainstorms at the end of January. The total rainfall at Sydney was 39·78 inches measured on 145 days. The greatest fall was in June, and the least in August. The mean temperature for the year was 63° 9. The maximum in the shade was 97°·6 on November 5, and the minimum 40°·6 on June 30. The mean temperature of the whole colony for 1885 was 63°·0, or 1°·7 in excess of the mean for 15 years. The absence of cloud, and the drought, have had a decided effect upon the temperature of the whole colony, showing apparently a direct relation between rainfall and temperature.

THE PROBLEM OF THE HOP PLANT LOUSE (PHORODON HUMULI, SCHRANK) *IN EUROPE AND AMERICA.*[1]

THE author has been for several years carrying on investigations with a view of ascertaining the full annual life-history of *Phorodon humuli*, and especially with a view of settling the hitherto moot question as to its winter life. The importance of the inquiry, both from the economic and the scientific sides, is self-evident. The hop crop, in all parts of Europe where it is grown, and especially in England, annually suffers more or less from the ravages of this its worst insect enemy, and in some years is a total failure. The same is true in North America, at least east of the Rocky Mountains, and last year the injuries of this Phorodon in the hop-growing regions of the State of New York were so great that many hop yards were abandoned and have since been ploughed up; while but 10 per cent. of an average crop was harvested. From the purely scientific side, entomologists, notwithstanding the great interest attaching to the subject, have been divided in opinion as to the identity, or specific relationship, of the hop Phorodon and one that occurs on Prunus, while the complete annual cycle of the insect's life has remained a mystery. After full and satisfactory investigations I have satisfied myself that, contrary to the prevailing impression among hop growers and previous investigators, the hop plant louse does not hibernate underground on the roots of the hop, nor in, on, or about anything in the hop yard; but that, upon the advent of the first severe frosts, the hop plant and the hop yards are entirely cleared of the species in any form. I find that all statements to the contrary in America are based on misapprehension, or mistaken identity of species, and I believe (though admitting the possibility of variation in this respect in milder climates) that the same will be found to hold true in England, where hibernation on the hop root has been accepted by high authority. The positive statements made about eggs being laid in autumn, whether on roots or upon the vines left in cutting, or which are carted away, are based on conjecture, and have been blindly copied without credit by one writer from another, a practice too common among second-hand writers on economic entomology.

The conjectures of some of the best students of aphidology that *Phorodon humuli* had a form (*malaheb*, Fonsc.) living on Prunus, and that there was a consequent migration from one plant to the other, I have positively proved to be correct, by direct colonizing from Prunus to Humulus, and by continuous rearing from the original stem-mother hatched from the winter egg.

The observations have been made on growing plants and in vivaria at Washington, and checked by others made simultaneously in hop yards at Richfield Springs, N.Y. An incident may here be recorded as illustrating the effect of meteorological extremes upon Aphides. The extreme heat (over 100° F.) and dryness of July 17 and 18 killed every one of the insects under observation at Washington, entirely clearing the plants. The economic bearing of such exceptional phenomena, as also of the biological observations made, is readily understood.

The more important conclusions from the studies so far made are thus summed up in a paper which I had the honour to read before the American Association at its recent meeting in New York:—

(1) *Phorodon humuli* hibernates in the winter egg state, this egg being fastened to the twigs (generally the previous year's growth) of different varieties and species of Prunus, both wild and cultivated. The egg is difficult to detect, because it is covered with particles which resemble the bark in colour and appearance. It is usually laid singly, and when freed of disguising particles is seen to be ovoid and 0·04 mm. long.

(2) The annual life-cycle is begun upon Prunus by the stem-mother, which hatches from this winter egg. The stem-mother is stouter than the individuals of any of the other generations, with the legs, antennæ, and honey-tubes relatively shorter, while the cornicles between the antennæ are sub-obsolete. The colour is uniform pale green, with bright red eyes and faintly dusky tarsi.

(3) Three parthenogenetic generations are produced upon Prunus, the second at once distinguished by its more elongate form, much longer members, distinct cornicles and markings of darker green; while the third (or typical *malaheb* form) becomes winged, and instinctively abandons the plum and migrates to Humulus. The habit of moving from plant to plant after giving birth to an individual, and thus scattering the germs of infection on Humulus, is well marked in this winged generation.

(4) During the development of the three plum-feeding generations, the hop is always free, and subsequently, until the return migration, the plum becomes more or less fully free from infection by this species.

(5) A number of parthenogenetic wingless generations are produced on the hop (seven, or the tenth from the stem-mother on plum, having been traced up to August 5, and advices of the eleventh, up to August 19, have been received since my arrival in England); and, finally, there is a return migration of winged females to the plum in autumn. The wingless hop generations are not only incapable of migrating to the plum, but do not thrive upon it when artificially transferred thereto.

(6) Exact observations are not yet complete as to the full number of generations produced upon the hop before the winged return migrant appears, and another month's careful watching and experiment is needed to fill this hiatus in the annual cycle, as also to ascertain the exact number of generations produced in autumn on the plum. From knowledge extant and previous general observation, the facts will probably prove to be as follows:—

(7) The eleventh or twelfth generation will produce winged females (from the middle to the end of August), which will deposit their young upon the plum, and these will become the only sexed individuals of the year, the male winged and the female wingless, the latter after coition consigning a few impregnated or winter eggs to the twigs.

(8) Up to August 5 the first females on hop were still alive and breeding, having existed two months. There is, consequently, an increasing admixture of generations from the first

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[1] Abstract of a Paper read before Section D of the British Association for the Advancement of Science, at Manchester, by Prof. C. V. Riley, on September 3.

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